Adopted Levels, Gammas

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	C. W. Reich	NDS 112,2497 (2011)	1-Jun-2011

Q(β^-)=−8.15×10^3 *syst*; S(n)=1.090×10^4 *8*; S(p)=59 *24*; Q(α)=5.33×10^3 *3* 2012Wa38

Note: Current evaluation has used the following Q record $ −8339 syst 10941 syst 94 syst 5305 *56* 2009AuZZ.

The uncertainties assigned to these estimated values by 2009AuZZ are as follows: for Q(β^-), 203; for S(n), 104; and, for S(p), 53. 2003Au03 report the following values (all from systematics): Q(β^-)=8330 *200*; S(n)=10930 *110*; S(p)=90 *50*; and Q(α)=5320 *60*.

Q(α): The large uncertainty from 2009AuZZ is assigned to allow for the possibility that the α decay is not between the two ground states. This value seems to be based on the assumption that the reported Eα value (5148 *3*) is associated with the decay of the ^{161}Ta g.s. (1/2$^+$). However, a recent study (O′Donnell et al., see below) establishes that this α transition is to be associated with the α-decay chain involving the (11/2$^-$) states in the heavier-mass chain members, ^{169m}Ir and ^{165m}Re. [This Eα value is a weighted average of: 5148 *5* (1979Ho10); 5149 *5* (1992Ha10); 5151 *4* (2005Sc22); and 5140 *7* (1996Pa01).].

Additional information 1.

A recent study (D. O′Donnell et al., (to be published); D.T. Joss, R.D. Page and D. O′Donnell (private communication, June, 2011)) has led to new insights regarding the (1/2$^+$) and (11/2$^-$) states in ^{161}Ta. In particular, they indicate that the decay data previously reported for the (1/2$^+$) state in ^{161}Ta are to be associated with the (11/2$^-$) state instead. At present, then, there are no decay data known for this (1/2$^+$) state.

All data on the excited states above the (11/2$^-$) level are from the ^{106}Cd(^{58}Ni,3pγ) study of 2011La01. See that source data set for additional details. From considerations of the systematics of the yrast bands in the heavier odd-A Ta isotopes, 2011La01 propose that there is a 9/2$^-$ level below the (11/2$^-$) level. This level has not yet been directly observed.

^{161}Ta Levels

For the labeling of the quasiparticle orbitals used here, see the ^{106}Cd(^{58}Ni,3pγ) source data set.

Cross Reference (XREF) Flags

- A ^{165}Re α decay
- B ^{165}Re α decay (2.32 s)
- C ^{106}Cd(^{58}Ni,3pγ)

E(level)	J$^\pi$	T$_{1/2}$	XREF	Comments
(0)	(1/2$^+$)		A	%ε+%β^+=?; %α=? XREF: A(?). The previously reported (2005Sc22) α branch from the ^{165}Re g.s. has not been confirmed in a subsequent study (D. O′Donnell et al., (to be published); D.T. Joss, R.D. Page and D. O′Donnell, (private communication, June, 2011)) by some of the same authors as 2005Sc22. The evaluator assumes that the existence of an α branch from the ^{165}Re g.s. leading to this state is presently an open question. E(level): It is assumed that a level with these properties occurs at, or near, the ^{161}Ta g.s., but this is not yet established. J$^\pi$: From the systematics of 1/2$^+$ and 11/2$^-$ states in the higher-mass members of the α-decay chains leading to this nuclide. T$_{1/2}$,%α: Values not presently known.
x	(11/2$^-$)	3.08 s *11*	BC	%ε+%β^+=?; %α=? From the study of O′Donnell et al. (see above), the 5148 *3* α transition is to be associated with the decay of this level rather than from the decay of the (1/2$^+$) state, as previously proposed. J$^\pi$: Fed by an α transition from an (11/2$^-$) state in ^{165}Re. T$_{1/2}$: Weighted average of: 3.16 s *+7−8* (2005Sc22), α(t); 3.00 s *18* (1992Ha10), α(t); and 2.7 s *2* (1986Ru05), α(t). Others: 2.4 s *6* (1981Ho10); and 4.9 s *8* (1996Pa01). T$_{1/2}$: 2011La01 propose the existence of a 9/2$^-$ level below this (11/2$^-$) level,

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Adopted Levels, Gammas (continued)

^{161}Ta Levels (continued)

E(level)	J^π	XREF	Comments
			connected by a low-energy, and as yet unobserved, M1 transition. If this is in fact the situation in ^{161}Ta, then it is likely that the reported $T_{1/2}$ and Eα values are to be associated with the decay of this $9/2^-$ level rather than the $(11/2^-)$ level. However, in the absence of further evidence for the existence of this $9/2^-$ level, the evaluator has not adopted this proposal.
396.0+x‡ *5*	$(13/2^-)$	C	
482.8+x† *5*	$(15/2^-)$	C	
956.2+x‡ *5*	$(17/2^-)$	C	
1083.2+x† *6*	$(19/2^-)$	C	
1583.4+x‡ *6*	$(21/2^-)$	C	
1677.4+x *11*		C	
1763.6+x† *7*	$(23/2^-)$	C	
1794.5+x& *9*	$(19/2^+)$	C	
1994.8+x *11*	$(21/2^+)$	C	
2073.2+x& *7*	$(21/2^+)$	C	
2176.4+x‡ *7*	$(25/2^-)$	C	
2243.6+x& *7*	$(23/2^+)$	C	
2321.2+x *21*		C	
2467.7+x† *8*	$(27/2^-)$	C	
2494.5+x *11*	$(25/2^+)$	C	
2528.3+x& *9*	$(25/2^+)$	C	
2537.6+x[a] *9*	$(25/2^+)$	C	
2652.1+x[b] *11*	$(27/2^+)$	C	
2741.8+x& *8*	$(27/2^+)$	C	
2760.3+x‡ *10*	$(29/2^-)$	C	
2817.4+x[a] *10*	$(29/2^+)$	C	
2891.9+x[c] *14*	$(29/2^+)$	C	
3016.7+x[b] *11*	$(31/2^+)$	C	
3089.8+x† *11*	$(31/2^-)$	C	
3169+x# *4*	$(29/2^-)$	C	
3261.2+x *13*	$(31/2^-)$	C	
3343.8+x[a] *11*	$(33/2^+)$	C	
3443.5+x‡ *12*	$(33/2^-)$	C	
3447+x@ *3*	$(31/2^-)$	C	
3467.2+x[c] *24*		C	
3573.7+x[b] *12*	$(35/2^+)$	C	
3689.2+x# *22*	$(33/2^-)$	C	
3762.2+x† *13*	$(35/2^-)$	C	
3872+x?[c] *3*		C	
3941.7+x[a] *12*	$(37/2^+)$	C	
4023.5+x@ *16*	$(35/2^-)$	C	
4058.8+x *16*	$(35/2^-)$	C	
4098+x?[c] *3*		C	
4202.7+x[b] *13*	$(39/2^+)$	C	
4218.1+x‡ *14*	$(37/2^-)$	C	
4313.9+x# *19*	$(37/2^-)$	C	
4445+x?[d] *3*		C	

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Adopted Levels, Gammas (continued)

^{161}Ta Levels (continued)

E(level)	J^π	XREF	E(level)	J^π	XREF	E(level)	J^π	XREF
4496.6+x[†] *15*	(39/2$^-$)	C	5061+x?[d] *4*		C	6024+x[@] *3*	(47/2$^-$)	C
4544.3+x[a] *14*	(41/2$^+$)	C	5070.9+x[‡] *25*	(41/2$^-$)	C	6093+x[†] *4*	(47/2$^-$)	C
4673.6+x[@] *19*	(39/2$^-$)	C	5088.5+x *25*		C	6382+x[#] *3*	(49/2$^-$)	C
4770+x?[c] *4*		C	5289.6+x[†] *25*	(43/2$^-$)	C	6764+x[@] *3*	(51/2$^-$)	C
4864.4+x[b] *15*	(43/2$^+$)	C	5328.4+x[@] *21*	(43/2$^-$)	C			
4980.7+x[#] *20*	(41/2$^-$)	C	5653.9+x[#] *25*	(45/2$^-$)	C			

[†] Band(A): $\pi h_{11/2}$ band, α=−1/2 branch. Band shows a backbend near $\hbar\omega$≈0.3 MeV, J^π=29/2, attributed to the alignment of a pair of $i_{13/2}$ neutrons. Conf is eEF or eAB.
[‡] Band(a): $\pi h_{11/2}$ band, α=+1/2 branch. See the comment on the α=−1/2 branch. Conf is fEF or fAB.
[#] Band(B): Band based on (29/2$^-$), α=+1/2. Possible conf is eAB → eABEF.
[@] Band(b): Band based on (29/2$^-$), α=−1/2. Possible conf is fAB → fABEF.
[&] Band(C): Band based on (19/2$^+$). Possible $\pi h_{11/2}$ coupled to 3$^-$ octupole excitation.
[a] Band(D): Band based on (25/2$^+$), α=+1/2 branch. Possible conf is eAF.
[b] Band(d): Band based on (25/2$^+$), α=−1/2 branch. Possible conf is fAF.
[c] Band(E): Tentative band based on (29/2$^+$), α=+1/2 branch. Possible conf is eAE.
[d] Band(e): Tentative band based on (29/2$^+$), α=−1/2 branch. Possible conf is fAE.

$\gamma(^{161}Ta)$

E_i(level)	J_i^π	E_γ	I_γ	E_f	J_f^π	Mult.
396.0+x	(13/2$^-$)	396.1 *5*	100	x	(11/2$^-$)	M1+E2
482.8+x	(15/2$^-$)	86.9 *20*	1.0 *1*	396.0+x	(13/2$^-$)	M1+E2
		482.7 *5*	100.0 *3*	x	(11/2$^-$)	E2
956.2+x	(17/2$^-$)	473.3 *5*	100 *5*	482.8+x	(15/2$^-$)	M1+E2
		560.4 *5*	83 *4*	396.0+x	(13/2$^-$)	E2
1083.2+x	(19/2$^-$)	127.5 *20*	2.2 *13*	956.2+x	(17/2$^-$)	M1+E2
		600.4 *5*	100 *5*	482.8+x	(15/2$^-$)	E2
1583.4+x	(21/2$^-$)	500.4 *5*	81.5 *4*	1083.2+x	(19/2$^-$)	M1+E2
		627.1 *5*	100 *5*	956.2+x	(17/2$^-$)	
1677.4+x		1194.6 *10*	100	482.8+x	(15/2$^-$)	
1763.6+x	(23/2$^-$)	180.0 *10*	8 *4*	1583.4+x	(21/2$^-$)	M1+E2
		680.2 *5*	100 *4*	1083.2+x	(19/2$^-$)	E2
1794.5+x	(19/2$^+$)	838.3 *10*	100	956.2+x	(17/2$^-$)	E1
1994.8+x	(21/2$^+$)	911.5 *10*	100	1083.2+x	(19/2$^-$)	E1
2073.2+x	(21/2$^+$)	278.7[†] *20*	12[†] *2*	1794.5+x	(19/2$^+$)	M1+E2
		990.0 *5*	100 *4*	1083.2+x	(19/2$^-$)	E1
2176.4+x	(25/2$^-$)	412.4 *5*	60 *3*	1763.6+x	(23/2$^-$)	M1+E2
		593.0 *5*	100 *5*	1583.4+x	(21/2$^-$)	E2
2243.6+x	(23/2$^+$)	170.7 *20*	8.4 *9*	2073.2+x	(21/2$^+$)	M1+E2
		449.2 *10*	61 *4*	1794.5+x	(19/2$^+$)	E2
		660.4 *5*	100 *6*	1583.4+x	(21/2$^-$)	
2321.2+x		1238.0 *20*	100	1083.2+x	(19/2$^-$)	
2467.7+x	(27/2$^-$)	291.1 *10*	24.8 *16*	2176.4+x	(25/2$^-$)	
		704.1 *5*	100 *5*	1763.6+x	(23/2$^-$)	E2
2494.5+x	(25/2$^+$)	251.7 *10*	100 *9*	2243.6+x	(23/2$^+$)	M1+E2
		422.0 *20*	74 *9*	2073.2+x	(21/2$^+$)	
		499.7 *20*	57 *13*	1994.8+x	(21/2$^+$)	
2528.3+x	(25/2$^+$)	285.4 *20*	21.0 *12*	2243.6+x	(23/2$^+$)	M1+E2
		454.7 *20*	23.5 *25*	2073.2+x	(21/2$^+$)	E2

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Adopted Levels, Gammas (continued)

γ(^{161}Ta) (continued)

E_i(level)	J_i^π	E_γ	I_γ	E_f	J_f^π	Mult.
2528.3+x	(25/2$^+$)	764.4 *10*	100 *7*	1763.6+x	(23/2$^-$)	E1
2537.6+x	(25/2$^+$)	(44)		2494.5+x	(25/2$^+$)	
		293.7 *10*	74 *3*	2243.6+x	(23/2$^+$)	M1+E2
		773.9 *10*	100 *6*	1763.6+x	(23/2$^-$)	
2652.1+x	(27/2$^+$)	114.9 *10*	100	2537.6+x	(25/2$^+$)	M1+E2
2741.8+x	(27/2$^+$)	213.4 *10*	41 *2*	2528.3+x	(25/2$^+$)	M1+E2
		498.7 *10*	62 *3*	2243.6+x	(23/2$^+$)	E2
		565.4 *5*	100 *5*	2176.4+x	(25/2$^-$)	E1
2760.3+x	(29/2$^-$)	293.0 *10*	32 *2*	2467.7+x	(27/2$^-$)	M1+E2
		583.6 *10*	100 *6*	2176.4+x	(25/2$^-$)	E2
2817.4+x	(29/2$^+$)	75.8 *20*	42 *4*	2741.8+x	(27/2$^+$)	
		165.6 *10*	100 *4*	2652.1+x	(27/2$^+$)	E2
		288.8 *20*	79 *4*	2528.3+x	(25/2$^+$)	E2
		349.2 *10*	83 *4*	2467.7+x	(27/2$^-$)	E1
2891.9+x	(29/2$^+$)	240.0 *10*	100	2652.1+x	(27/2$^+$)	
3016.7+x	(31/2$^+$)	125.6 *20*	1.6 *8*	2891.9+x	(29/2$^+$)	
		199.3 *5*	100 *4*	2817.4+x	(29/2$^+$)	M1+E2
3089.8+x	(31/2$^-$)	329.6 *10*	44 *4*	2760.3+x	(29/2$^-$)	M1+E2
		622.0 *10*	100 *7*	2467.7+x	(27/2$^-$)	
3261.2+x	(31/2$^-$)	793.5 *10*	100	2467.7+x	(27/2$^-$)	
3343.8+x	(33/2$^+$)	327.1 *5*	100 *5*	3016.7+x	(31/2$^+$)	M1+E2
		526.3 *10*	33.6 *25*	2817.4+x	(29/2$^+$)	
3443.5+x	(33/2$^-$)	354.2 *20*	18.2 *15*	3089.8+x	(31/2$^-$)	
		683.0 *10*	100 *6*	2760.3+x	(29/2$^-$)	E2
3447+x	(31/2$^-$)	278.7† *20*	100†	3169+x	(29/2$^-$)	
3467.2+x		575.3 *20*	100	2891.9+x	(29/2$^+$)	
3573.7+x	(35/2$^+$)	229.9 *10*	84 *4*	3343.8+x	(33/2$^+$)	M1+E2
		557.0 *5*	100 *5*	3016.7+x	(31/2$^+$)	
3689.2+x	(33/2$^-$)	241.8 *20*	100	3447+x	(31/2$^-$)	
3762.2+x	(35/2$^-$)	318.4 *20*	100	3443.5+x	(33/2$^-$)	
		672.5 *10*	100	3089.8+x	(31/2$^-$)	
3872+x?		405.3 *20*	100	3467.2+x		
3941.7+x	(37/2$^+$)	368.0 *5*	100 *4*	3573.7+x	(35/2$^+$)	M1+E2
		598.0 *10*	46 *3*	3343.8+x	(33/2$^+$)	
4023.5+x	(35/2$^-$)	334.5 *20*	63 *4*	3689.2+x	(33/2$^-$)	
		761.9 *10*	100 *7*	3261.2+x	(31/2$^-$)	E2
4058.8+x	(35/2$^-$)	798.0 *10*	100	3261.2+x	(31/2$^-$)	
4098+x?		227.1 *20*	27 *5*	3872+x?		
		631.2 *10*	100 *9*	3467.2+x		
4202.7+x	(39/2$^+$)	261.4 *10*	44 *3*	3941.7+x	(37/2$^+$)	M1+E2
		629.0 *5*	100 *5*	3573.7+x	(35/2$^+$)	
4218.1+x	(37/2$^-$)	455.8 *20*	13 *4*	3762.2+x	(35/2$^-$)	
		774.6 *10*	100 *5*	3443.5+x	(33/2$^-$)	E2
4313.9+x	(37/2$^-$)	256.7 *20*	31 *5*	4058.8+x	(35/2$^-$)	
		289.6 *20*	100 *5*	4023.5+x	(35/2$^-$)	M1+E2
		624.6 *20*	84 *11*	3689.2+x	(33/2$^-$)	
4445+x?		346.4 *20*	100 *8*	4098+x?		
		572.8 *20*	75 *16*	3872+x?		
4496.6+x	(39/2$^-$)	278.6 *10*	77 *4*	4218.1+x	(37/2$^-$)	
		734.4 *10*	100 *8*	3762.2+x	(35/2$^-$)	
4544.3+x	(41/2$^+$)	341.9 *10*	100 *5*	4202.7+x	(39/2$^+$)	M1+E2
		602.3 *10*	90 *5*	3941.7+x	(37/2$^+$)	
4673.6+x	(39/2$^-$)	359.8 *10*	100 *7*	4313.9+x	(37/2$^-$)	M1+E2
		649.4 *20*	53 *7*	4023.5+x	(35/2$^-$)	
4770+x?		671.5 *20*	100	4098+x?		

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Adopted Levels, Gammas (continued)

$\gamma(^{161}Ta)$ (continued)

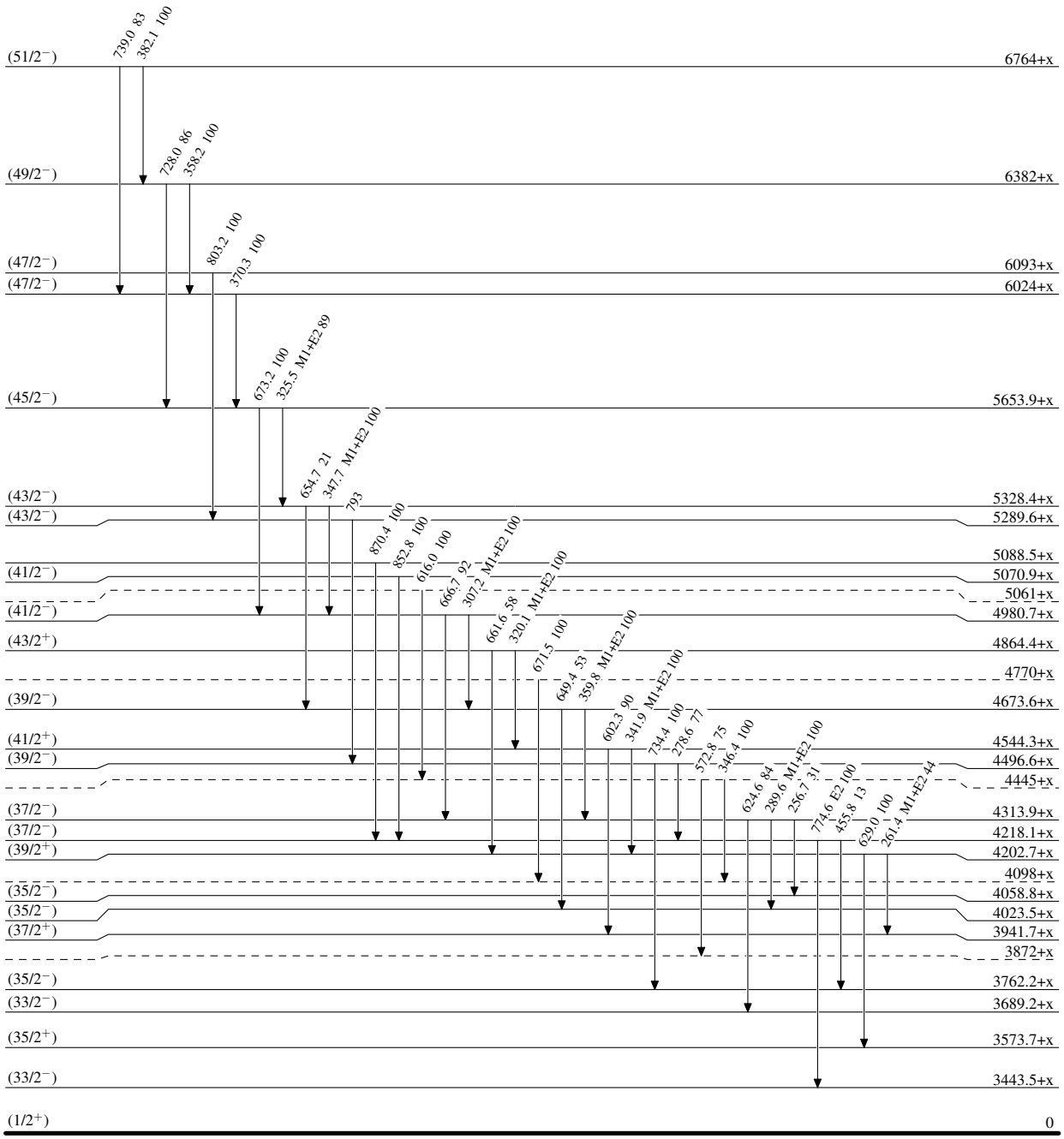
E_i(level)	J_i^π	E_γ	I_γ	E_f	J_f^π	Mult.
4864.4+x	(43/2$^+$)	320.1 *10*	100 *4*	4544.3+x	(41/2$^+$)	M1+E2
		661.6 *10*	58 *5*	4202.7+x	(39/2$^+$)	
4980.7+x	(41/2$^-$)	307.2 *10*	100 *8*	4673.6+x	(39/2$^-$)	M1+E2
		666.7 *10*	92 *8*	4313.9+x	(37/2$^-$)	
5061+x?		616.0 *20*	100	4445+x?		
5070.9+x	(41/2$^-$)	852.8 *20*	100	4218.1+x	(37/2$^-$)	
5088.5+x		870.4 *20*	100	4218.1+x	(37/2$^-$)	
5289.6+x	(43/2$^-$)	793 *2*		4496.6+x	(39/2$^-$)	
5328.4+x	(43/2$^-$)	347.7 *10*	100 *7*	4980.7+x	(41/2$^-$)	M1+E2
		654.7 *20*	21 *7*	4673.6+x	(39/2$^-$)	
5653.9+x	(45/2$^-$)	325.5 *20*	89 *11*	5328.4+x	(43/2$^-$)	M1+E2
		673.2 *20*	100 *11*	4980.7+x	(41/2$^-$)	
6024+x	(47/2$^-$)	370.3 *10*	100	5653.9+x	(45/2$^-$)	
6093+x	(47/2$^-$)	803.2 *20*	100	5289.6+x	(43/2$^-$)	
6382+x	(49/2$^-$)	358.2 *10*	100 *9*	6024+x	(47/2$^-$)	
		728.0 *20*	86 *18*	5653.9+x	(45/2$^-$)	
6764+x	(51/2$^-$)	382.1 *20*	100 *8*	6382+x	(49/2$^-$)	
		739.0 *20*	83 *17*	6024+x	(47/2$^-$)	

† Multiply placed with intensity suitably divided.

Adopted Levels, Gammas

Level Scheme

Intensities: Relative photon branching from each level

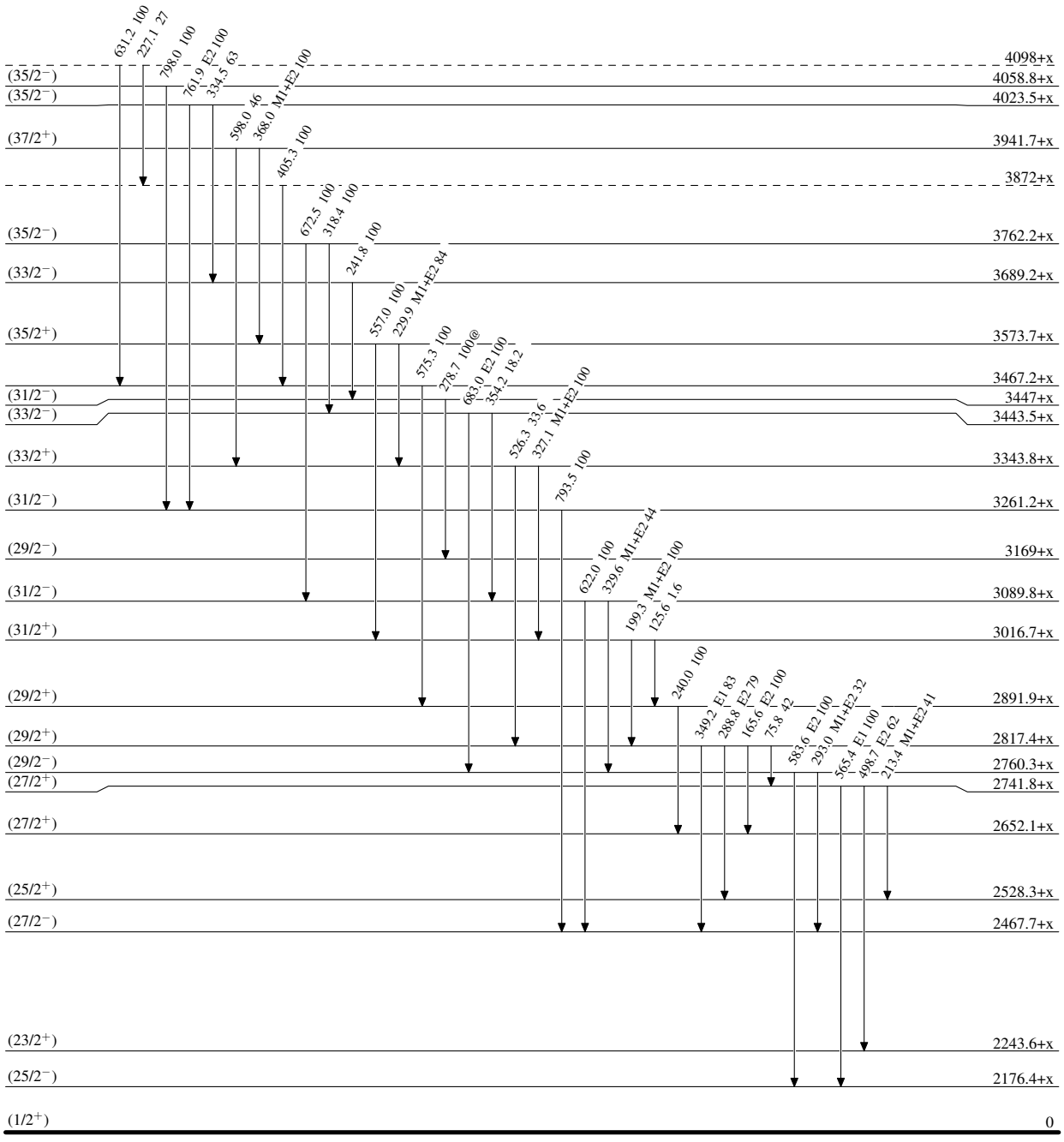


$^{161}_{73}Ta_{88}$

Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level
@ Multiply placed: intensity suitably divided



$^{161}_{73}Ta_{88}$

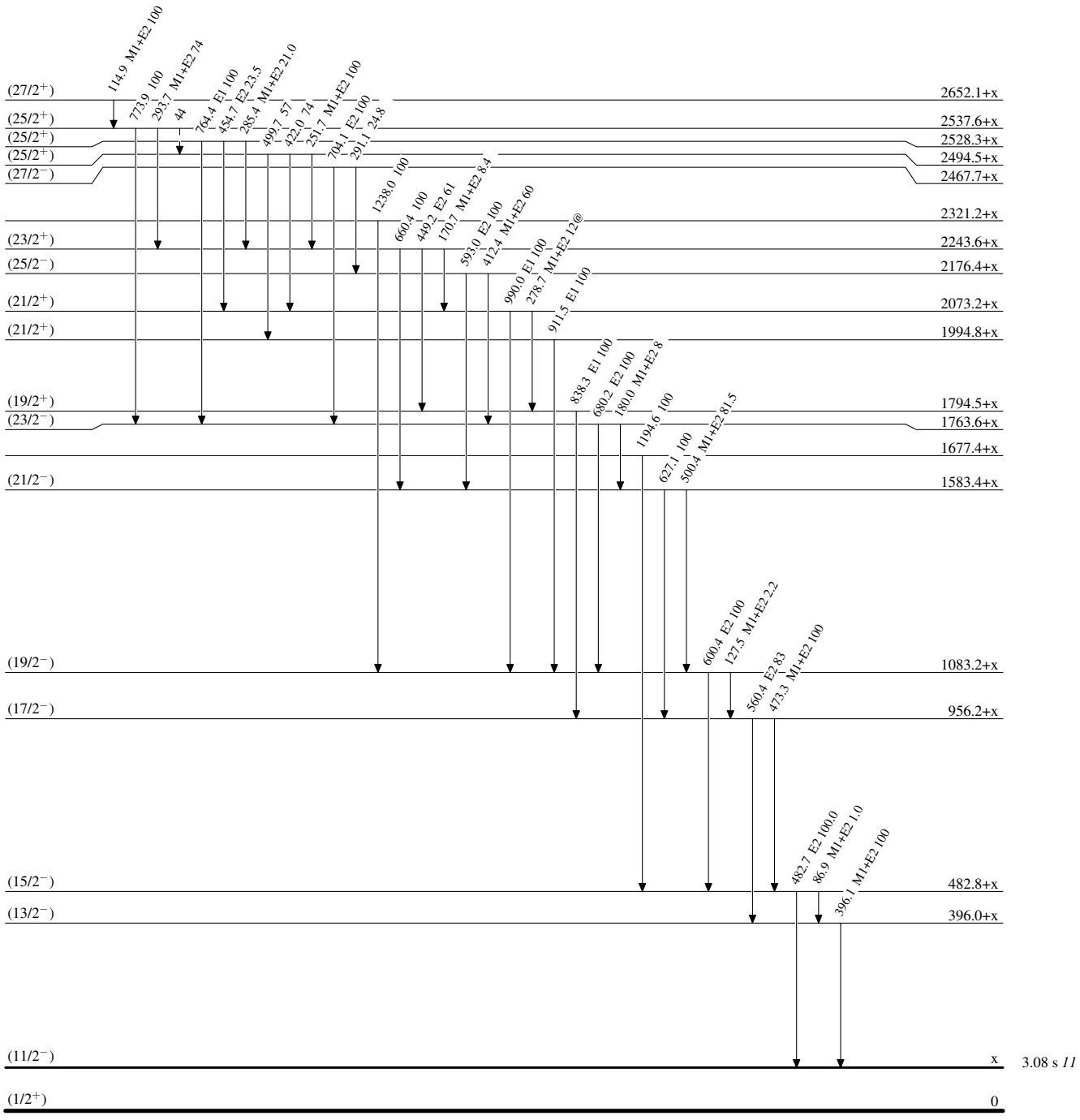
Adopted Levels, Gammas

Legend

Level Scheme (continued)

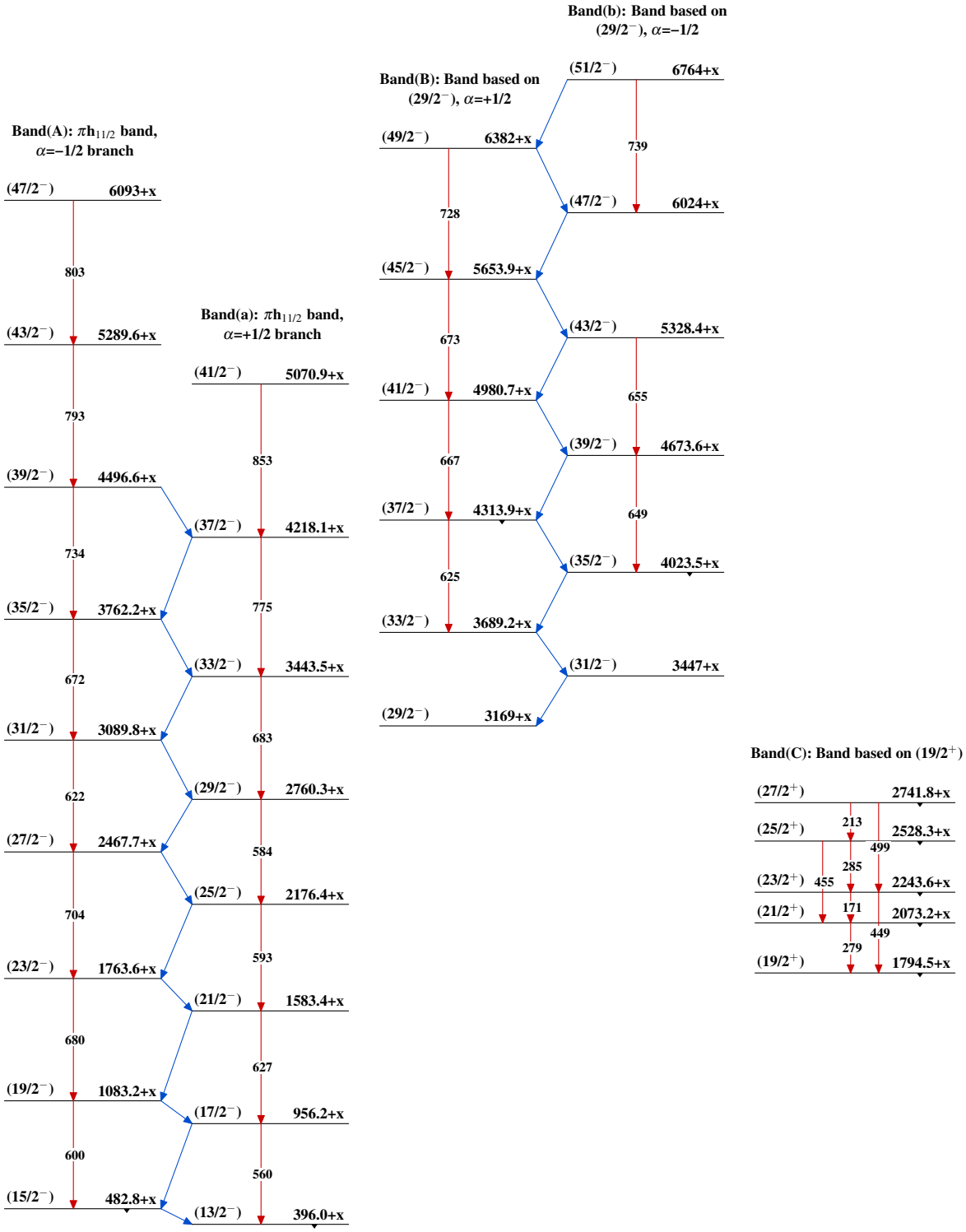
Intensities: Relative photon branching from each level
@ Multiply placed: intensity suitably divided

- - - - - - ► γ Decay (Uncertain)

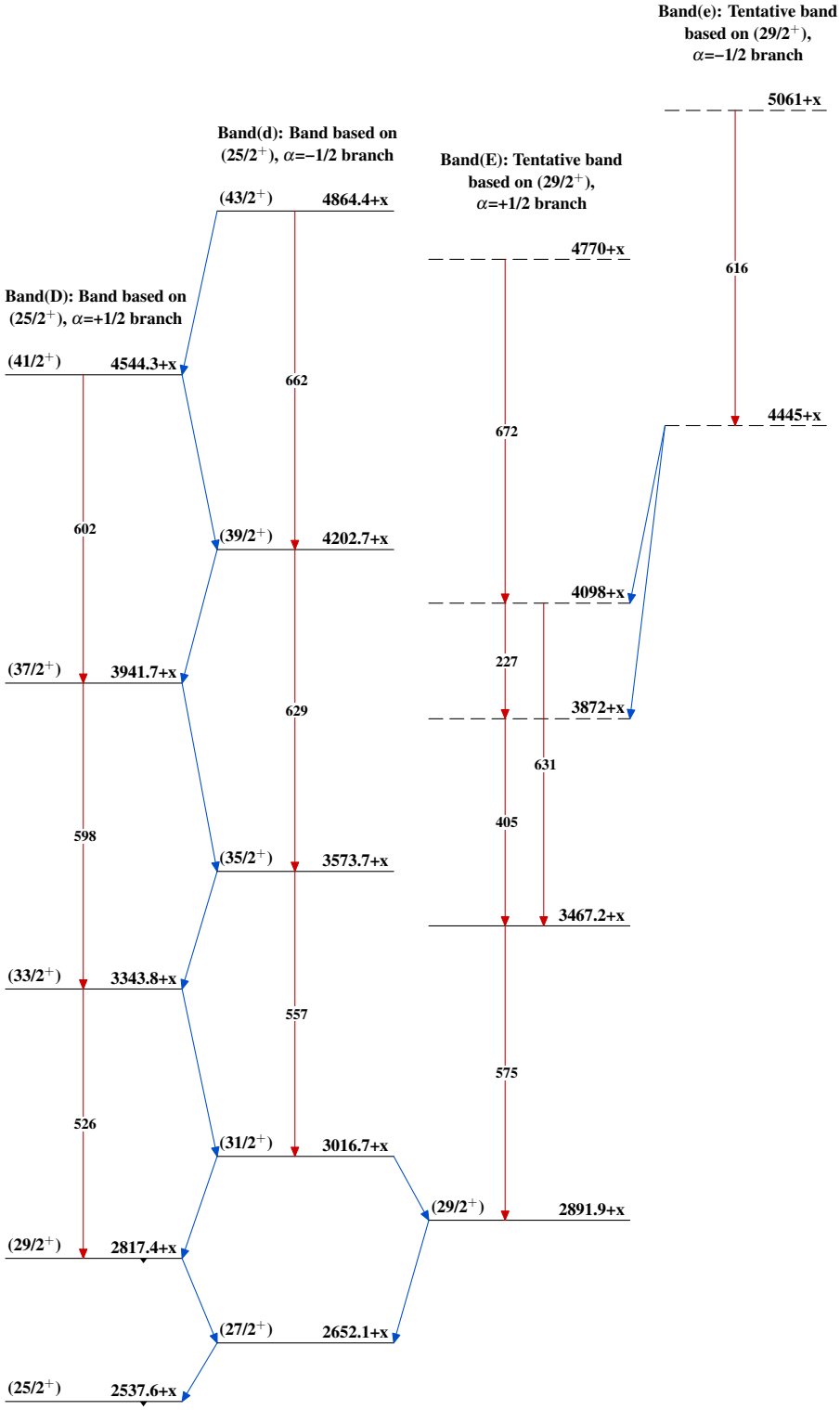


$^{161}_{73}Ta_{88}$

Adopted Levels, Gammas



Adopted Levels, Gammas (continued)



$^{161}_{73}Ta_{88}$